

Combating malnutrition by increasing uptake of fortified rice in India



>70%
people across India are consuming less than half their recommended dietary allowance of key micronutrients

\$ Each year, India loses **>US\$12** billion in gross domestic product due to nutrient deficiencies

An estimated two billion people worldwide suffer from vitamin and mineral deficiencies. The country with the highest burden is India. Each year, India loses more than US\$12 billion in gross domestic product due to nutrient deficiencies. Iron deficiency anemia contributes to half of all anemia cases and results in an eight-point lower IQ in children. Addressing this gap is essential to improve health and to sustain economic growth and development.

Micronutrient fortification is an optimum solution to tackle malnutrition

Food fortification involves adding minute quantities of vital nutrients deficient in the diets of a population, such as iron, folic acid, vitamin D, and vitamin A to commonly consumed foods like rice, wheat flour, oil, and milk.

At the Copenhagen Consensus 2012, a team of Nobel Laureate economists ranked fortification with micronutrients (i.e. vitamins and minerals) as the most effective investment that could be made with massive benefits for a tiny price tag. It has also been ranked among the top three international development priorities.



Fortification yields **US\$84** for every US dollar spent on reducing iron deficiency anemia prevalence.



Correcting iron deficiency yields benefits in increased cognitive ability for children as well as greater endurance and work capacity of adults, with an estimated

8:1
benefit: cost ratio



Micronutrient fortification of widely consumed staple foods is also considered to be a sustainable solution for improving the health of entire communities, as it prevents deficiencies from occurring, while also minimizing the need for behavior change.

Rice fortification is an ideal intervention to bridge dietary nutrient gaps and improve health

India is the second largest producer of rice worldwide. Rice is also the staple food for an estimated 65 percent of the population, for whom

Rice is the staple food for an estimated **65%** of the population

it constitutes 50 percent of energy intake. It also has the highest uptake in government safety net programs including the Midday Meal Scheme, Integrated Child Development Services, and the Public Distribution System. In this context, rice fortification is an ideal tool to bridge dietary nutrient gaps and improve health, particularly among vulnerable population.

Fortified rice is produced using extrusion technology. Milled rice is powdered and mixed with a premix containing vitamins and minerals that can be matched to local nutrient needs. Fortified rice kernels are produced from this mixture using extruder (pasta making) equipment. These fortified kernels are then added to traditional rice in a ratio ranging from 1:50 to 1:200, resulting in fortified rice nearly identical to traditional rice in aroma, cooking properties, taste, and texture.

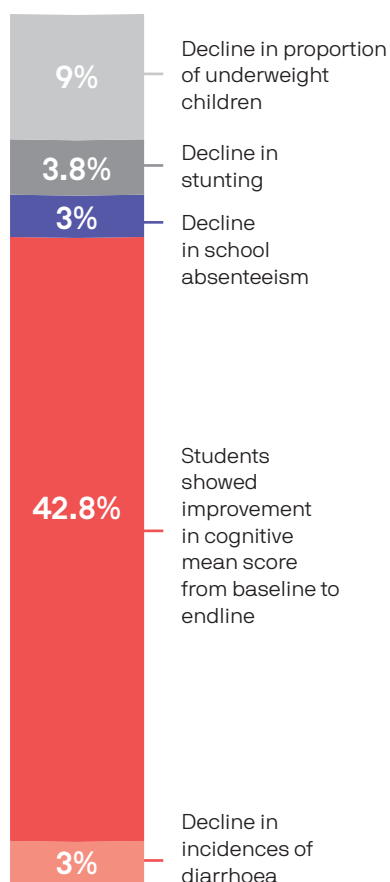
PATH is at the forefront of efforts to increase reach of fortified rice

A leader in global health innovation, PATH is at the forefront of finding and implementing effective approaches to improve maternal, newborn, and child health and nutrition. For more than two decades, our experts have helped develop the best methods to fortify rice with vitamins and minerals not only in India but also in Brazil, Bhutan, Burundi, Cambodia, Myanmar, and various West African countries.

To ensure that the benefits of fortified rice reach as many people as possible, we are expanding evidence, developing global markets, and working to increase adoption worldwide. We are also supporting stakeholders to introduce, test, use, and scale fortified rice to combat malnutrition and improve lives.

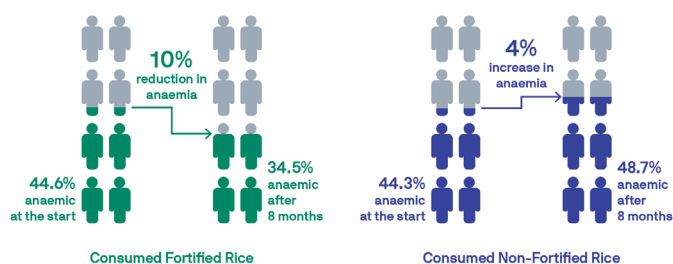
Impact on nutritional indicators of school-going children as a result of consuming fortified rice under the Midday Meal Scheme

Karnataka
Number of Children enrolled in Study (n)= 1661

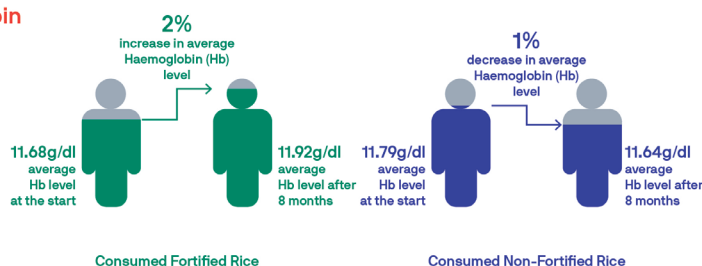


Gujarat
Number of Children enrolled in Study (n)= 973

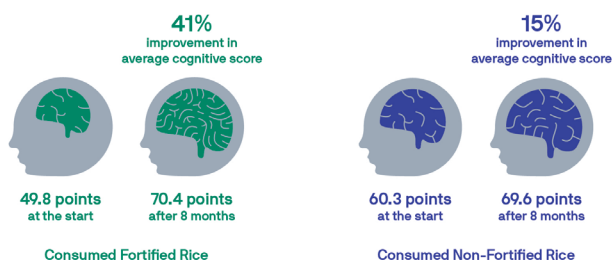
Anaemia



Haemoglobin (Hb) Levels

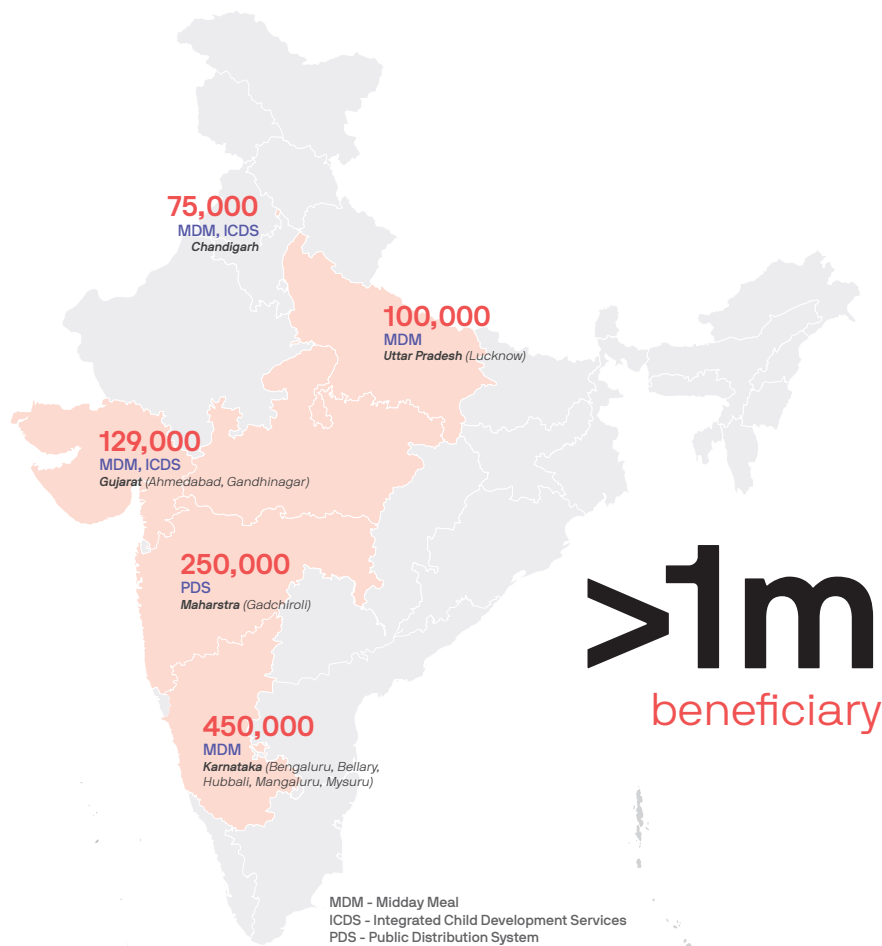


Cognitive Development



Our work includes:

- **Generating impact evidence.** PATH has led efforts in generating evidence on rice fortification. A study in collaboration with National Institute of Nutrition and Department of Biotechnology commenced in 2008 in Andhra Pradesh showed that consuming fortified rice reduced iron deficiency from 33% to 14% and iron deficiency anemia from 15.9% to 7.9% among residential school children. PATH has also worked on generating evidence on the impact of fortified rice meals on children in Gujarat and Karnataka. Evaluation studies undertaken on the school feeding programs, such as Midday Meal Scheme, have confirmed that daily consumption of fortified rice leads to reduction in anemia, and improved nutritional and cognitive indicators among school children.
- **Establishing operational feasibility.** In 2010, PATH facilitated a pilot in Andhra Pradesh to determine technical and operational feasibility of integrating fortified rice in the Midday Meal Scheme. The pilot was successful as fortified rice was well accepted by children. Additionally, the fortified kernels were able to withstand Indian conditions of transport, cooking, and usage with no change in taste, color, odor, homogeneity, or nutrient composition. Similar trials were also conducted in Rajasthan and with telemedicine centers in Uttar Pradesh to test the market-based approach. These efforts reached 250,000 children.
- **Boosting quality innovation.** PATH has worked with partners to develop efficient and cost-effective blending systems and quality validation methods to produce rice that is consistently of a high standard. Based on research and development over the years, PATH has considerably lowered the cost for the blending of normal rice and fortified rice kernels to produce fortified rice.
- **Strengthening the domestic supply chain.** To increase availability of fortified rice across the country, PATH continues to transfer its Ultra Rice® technology to leading rice millers to help them produce grains for distribution through public-sector channels and private-sector markets.
- **Providing technical assistance.** PATH provides technical assistance to the national and several state governments in scaling up rice fortification through safety net programs. We are also working with the Food Safety and Standards Authority of India to develop quality control and assurance protocols for program scale up.
- **Bringing fortified rice in open markets.** Given that we have a vibrant and dynamic private sector which is coming forward to implement new initiatives, we also assist industry to supply fortified rice in the open market so that it has a wide reach. We have generated the world's largest knowledge base for



rice fortification; and created a model for public-private partnership that can deliver high-quality fortified rice to the last mile.

- **Integrating fortified rice into public-sector programs.**

To tackle malnutrition in children and improve their health, PATH, in partnership with the Akshaya Patra Foundation introduced a comprehensive nutrition program in the government schools in Karnataka, Uttar Pradesh, and Gujarat by introducing midday meals containing fortified rice. PATH has supported the Chandigarh administration to introduce fortified rice under Integrated Child Development Services and Midday Meal Scheme. We have provided technical support to Tata Trusts to introduce fortified rice through the Public Distribution System in two blocks of Gadchiroli district in Maharashtra. These efforts are sustained through government funding.

Our programs are coupled with complementary activities, such as educating the community on nutrition and hygiene to encourage healthy behaviors. Through this holistic approach, the students, teachers and parents understand the benefits of eating fortified rice, as well as realize the importance of clean and hygienic surroundings, personal hygiene, and safe drinking water to live a healthy life.

So far, PATH's rice fortification programs in India have benefitted one million people. However, we can reach 800+ million people in India, especially women and children through the government's safety net programs, making rice fortification a viable tool to reduce vitamin and mineral deficiencies at scale. Moreover, the cost of fortification is minimal, between 50 and 80 paise / kg, especially when compared to the negative health and economic costs of micronutrient deficiencies. Scaling up rice fortification will improve the health of India's families and communities as well as enhance the productivity of the country at large.

Key successes



- PATH has collaborated and supported the Government of India in developing policy and operational guidelines for introduction of fortified rice under the safety net programs.



- With PATH's assistance, Food Safety and Standards Authority of India has formulated staple food fortification regulations.



- Based on the success in Karnataka, the state government has proposed scale up of the program in four additional districts of the state which will reach one million children each in Midday Meal Scheme and Integrated Child Development Services.



- We have helped establish multiple low-cost, high-quality facilities for production of fortified rice.





- By strengthening local manufacturing, distribution, and marketing efforts, we have established strong base for market development and distribution of fortified rice through India's public- and private-sector channels.

For more information, please contact:

PATH India Country Program Office
15th floor, Dr. Gopal Das Bhawan,
28 Barakhamba Road, New Delhi- 110001

T: +91-11-4064-0000
F: +91-11-4064-0099
E: india@path.org

 www.path.org/india
 [/PATHGlobalHealth](https://www.facebook.com/PATHGlobalHealth)
 [/PATHTweets](https://twitter.com/PATHTweets)
 [/Company/PATH](https://www.linkedin.com/company/path)